

THE ANALYST.

FEBRUARY, 1892.

PROCEEDINGS OF THE SOCIETY OF PUBLIC ANALYSTS.

THE ANNUAL MEETING of the Society of Public Analysts was held on the 6th January 1892, the President being in the chair.

The minutes of the last meeting were read and confirmed.

In the absence of the Treasurer, Mr. Dyer submitted the Balance Sheet for the year 1891, which was, upon the motion of Mr. F. H. Perry Coste, seconded by Mr. Bertram Blount, unanimously adopted.

The President (Mr. Otto Hehner) then read his Annual Address! as follows :—

GENTLEMEN,

For many years past, my predecessors in this chair have, on the occasion of the Annual Meeting of the Society of Public Analysts, been able to speak of its flourishing condition and its progress. I am happy to-day to be in the same fortunate position, the year 1891 having been a satisfactory one in every respect.

We have elected nine new members and two associates, whilst we have lost by death, by resignation, and by removal, one member each, and by resignation two associates, so that we had on our lists on January 1st, 1892, 9 honorary and 172 ordinary members, and 23 associates—a total of 203.

The member taken by death during 1891 was not personally known to me, or, I believe, to any of us—Mr. Ernest Francis, of the Government Laboratory, Georgetown, Demerara. He had been a member for a considerable number of years.

On the second day of January of this year our Society lost one of its most esteemed members—Mr. Charles Heisch—the tidings of whose death will be received with sorrow by all chemists throughout the country. Mr. Heisch was one of the few surviving founders of the Chemical Society, and one of the fathers of the Society of Public Analysts. With the late Mr. Wigner he piloted it through its early stages, which, I need not remind you, were beset with many difficulties. For six years he filled the post

of Secretary, and for two that of President of the Society of Public Analysts, and it* will always be remembered how faithfully he devoted himself to the advancement of the interests of Public Analysts. In his old age he was as clear-minded and energetic as the youngest of us, and ever kept abreast of the science which we represent. We all admired and loved the genial man, who to the very last retained a warm heart and a youthful spirit. His memory will be always dear to us.

Our balance-sheet shows this year an apparent reduction in our funds, for while last year we possessed about £323 we have at the present time only about £232, the difference being accounted for by the fact that from July 1st, 1891, the Society acquired the property of THE ANALYST Journal for the sum of £126. Allowing for this as an asset, our balance is the better by £35, to which must be added the sum of about £20, which we have to our credit on THE ANALYST account, so that, compared with last year, we are the richer this year by about £55.

The purchase of THE ANALYST has been an event of the greatest importance for the Society. You are all aware that THE ANALYST was started and originally owned by the Society. In the early years of our history, unfortunately, the funds were found inadequate to maintain a Journal, and it passed for that reason into the hands of Messrs. Wigner and Muter, and after the death of Mr. Wigner into those of Dr. Muter, who for many years maintained THE ANALYST by his own efforts, aided by an annual subsidy from the Society. When in the course of following years our financial condition improved, it was felt that the original intention of the founders of THE ANALYST, that is to say, of the Council of 1877, should be carried out. We have accordingly, as I have stated, and as is well known to all of you, re-purchased the copyright of the Journal. The time which has since elapsed is too short to allow of any conclusion being drawn as to the financial results of this step, although there cannot be the slightest doubt that it will prove a satisfactory one in every way. We have taken over THE ANALYST in the middle of a year, and have not, therefore, had the benefit of the bulk of the subscriptions, which become due at the beginning of each year; nor can there have been as yet any appreciable effect upon the circulation of the paper, which, it is hoped, will attend upon the efforts of the committee to make THE ANALYST a faithful and rapid record of the advance of all branches of Analytical Chemistry.

The present Editorial Committee have always had a superabundance of matter for insertion in the journal; indeed, the time is rapidly approaching when the enlargement of the paper will be unavoidable. Analytical chemistry throughout the world has, during the last few years, shown signs of great activity. In Germany and America several new and excellent Journals have been started, entirely or mainly devoted to analytical chemistry. The time when every chemist rushed into the field of exploration of new organic compounds—this fascinating pursuit, which for years has absorbed almost exclusively the attention of chemists—seems to near its end, and a due share of attention is again directed, as in the days of Berzelius, Liebig, Rose and Fresenius, to the necessary and careful analytical study of the innumerable compounds with which we are now

acquainted. This study has been far too long neglected. And if this country is not to remain behind in the race after new and applied knowledge, a good Analytical Journal is an absolute necessity. Not only Public Analysts are in need of it, but every technical and analytical chemist, and, not least, every manufacturer. THE ANALYST ought to fill, and surely will fill, that want. Analytical information is at present scattered piecemeal in the *Journal of the Chemical Society*, in that of the *Society of Chemical Industry*, in the *Chemical News*, and one or two other papers, but there is not published in this country any journal which collects all news of valuable analytical methods and advancements such as does, and has done for nearly thirty years, the *Zeitschrift fuer Analytische Chemie*, published by R. Fresenius. THE ANALYST ought to fill this position in the English language, and the efforts of the Society should be directed to that end.

Twenty-five papers were read before the Society in the course of last year. I give, in accordance with previous custom, a list of these :—

A Comparison of English and American Cider, by G. EMBREY.

On the Composition of Milk and Milk-products, DR. VIETH.

Remarks on the Analysis and Composition of Butter-fat, O. HEHNER.

On Malt Vinegar, O. HEHNER.

Some further points in the Detection of Adulteration of Vinegar, DR. W. J. SYKES.

A Method of detecting Butter mixed with Cocoa-nut Fat, DR. J. MUTER.

On measuring Milk for Quantitative Analysis, DR. P. VIETH.

Extraction of Fat from Milk-solids, A. W. STOKES.

On the Examination of Spirituous Liquids for Secondary Constituents, A. H. ALLEN and W. CHATTAWAY.

On the Action of Milk-preservatives, A. W. STOKES.

On the Influence of Boric Acid on Peptic Digestion, O. HEHNER.

Note on the Composition of Butter-fat, A. H. ALLEN.

Fat-free Paper for use in Milk-analysis, P. VIETH.

Fat-Extraction and Fat-calculation in Milk-analysis, P. VIETH.

Note on Tabarie's Process for the Indirect Determination of Alcohol T. B. BLUNT.

On the Determination of Alcohol by Tabarie's Method, A. H. ALLEN.

On the Adulteration of White Pepper, W. F. K. STOCK.

Note on the Schmid process, A. W. STOKES.

Notes from the Khedivial Laboratory, Cairo, H. D. RICHMOND.

Note on Tabarie's Process, SIDNEY HARVEY.

On Boracic Acid and Borax in Milk and Butter, W. W. FISHER.

Note on the Adulteration of Basic Slag, B. DYER.

On Gamoose-butter, H. D. RICHMOND.

Fat Extraction and Fat Calculation in Milk Analysis, H. D. RICHMOND.

Sixteen years have now elapsed since the Sale of Food and Drugs Act came into force, and since, with the creation of the Public Analyst, as we know him to-day, systematic analyses of articles of food, drink, and drugs, were undertaken. These sixteen

years have been an almost uninterrupted struggle with adverse circumstances. Methods of analyses had to be newly devised or improved; the composition of all articles of food had to be studied with far greater precision than before; experience had to be gained; analysts had to be educated; an intricate Act of Parliament had to be understood, and to be made workable; the public had to be taught to place confidence in the newly-created body of men; dealers had to be convinced of the honesty and capacity of the officers under the Act; unwilling justices of the peace, magistrates, and county councillors had to be brought to see that the Food Act was one of the most important they would have to administer to the bodily and material welfare of the people. Not one of these points has been finally reached, but steady progress has at least been made.

As to the education of Public Analysts, this Society by its meetings and by *THE ANALYST* Journal has accomplished much; far more than the most sanguine could have hoped fifteen years ago. It must be admitted, as it always freely has been admitted, that when the Act came into force, and men had to be appointed Public Analysts, here and there an incompetent one crept into the ranks; but at the present time no large district or important borough, at least, is without an Analyst, whose work and capacity is not only creditable to himself but also to his appointing authority. In a few smaller boroughs, in which the Act is barely in operation, there may survive a few remnants of a bygone age; may be a medical officer, who unwillingly accepted the post of Public Analyst because it was compulsorily coupled by short-sighted vestrymen with the post for which he was trained and which he fills worthily—that of sanitary officer. We may confidently look forward to the time when even these few will have made room for Analysts, who are Analysts by profession and study, and not by compulsion.

The public have never taken kindly to the Food Act, and have not mastered its details and intricacies. Probably they never will, but, on the whole, I think they look thankfully upon us as a body.

The trade in articles of food—and I take this to be a most satisfactory position to have attained—have, to a very great extent, abandoned their loudly-expressed hatred and contempt for Public Analysts. The trade-papers no longer teem with flouts and jibes at our expense, for the honest dealers—and the vast bulk of traders *are* honest—have recognised that even if the Act often times cuts hard against a man who has not the remotest intention to defraud, and yet found tripping, is brought before a magistrate as a malefactor, is held up to public opprobrium and fined—that in spite of such cases of hardship, which are due to the Act itself—the Public Analysts are their best friends, without whom honest and legitimate trade could hardly be carried on. A single dishonest dealer, if he were undisturbed, could by underselling, based upon adulteration, and upon fraud, disturb the equilibrium of a whole town, or even of a whole district, forcing competitors against their own will and desire into similar practices, if they wished to live. A butter-factor—such is a case in my own recent experience—who stoops to skilfully adulterate his butter with a moderate, yet paying percentage of margarine, so that he can undersell his honest

neighbours, can for a time compel a whole country-side to follow suit, with the disastrous consequence that the produce of a whole country may temporarily come into discredit. This happened last year in Belgium, whence for a time not a pound of butter was imported into England; and this year again, only a few weeks ago, in Italy, with almost equally disastrous results. Milk-dealers, again, now see in the analyst their friend, where fifteen and even ten years ago they thought they beheld their worst enemy.

Yet the Act, as I have said, often presses hard upon honest vendors. Articles of food pass through many hands before they reach the public or, may be, the inspector under the Act, and through him the analyst; the last link of the chain, the retailer, has to pay for the sins of all others, be these his shop assistants, the wholesale dealer, importer, factor or producer. A butter-man cannot have everyone of his consignments analysed, nor can every churn of milk be examined before it is sold. A warranty, in the absence of an analysis, is no protection, at least for the wholesale house or the importer, for these are often cheated in spite of the warranty, by the foreign shippers, who cannot be reached by the Food Act at all, but only by other legal proceedings, and then very rarely and after much litigation and expense. Over and over again have I seen dealers fined, or have been instrumental in getting them fined, who, I verily believe, were as honest as I hope I am myself. And yet I see no remedy for this. Certainly the stupid practice of many magistrates to let them off with a penny fine, is no remedy, but rather a crime against the public, who must, in the first instance, be protected in an effectual manner against fraud, intentional or unintentional. Only repeated hard cases can bring us into the way a real remedy. A warrant given by a wholesale house should always protect the retailer, but a warranty from one wholesale house to another, or from a foreign shipper to a wholesale dealer in England, should not protect, because the large dealer can either keep his own analyst or cause effectual chemical supervision to be made in a systematic manner, thus practically excluding deception.

At the present time, I regret to say, the main obstacles to the full carrying out of the Food Act are magistrates, and especially London magistrates. To read of penny fines inflicted for a gross deception of the public; to see excuses admitted, with magisterial benevolence, as must be uttered by offenders with tongue in cheek; to hear of cases dismissed because two analysts cannot agree within one or two units per cent. in their opinion as to the quantity of the adulterant, though both agree to the fact of adulteration, is, I again say, a fraud upon the public.

In spite of such obstacles the effects of the Act have been nothing short of startling, and have resulted in the saving of hundreds of thousands, nay, millions, of pounds of the public money. In the five years, 1877-81, the percentage of samples found adulterated in the whole of England and Wales was 16.2, from which figure it has regularly and steadily declined to 11.2 in 1890; that is to say, in fifteen years a reduction of 31 per cent. of the total adulteration. 27,465 samples were analysed during 1890, of which 3,069 were reported to be adulterated. Considering these large figures the unbiassed observer must admit that the Act has worked with very little friction indeed. But rarely

is a case of disputed analysis heard of nowadays, and references to Somerset House, with results contradictory to those obtained by the Public Analyst, are getting yearly fewer. Analysts have learnt their work and our referees, Somerset House, have likewise profited by the education afforded by this Society. From out of so large a number of cases of reported adulteration there will and must always arise a few cases of dispute, nay, there will ever be a few mistakes, for Public Analysts are no more infallible than are judges, whose judgments are reversed on appeal to higher courts. As a body, we can proudly say that our work is well and efficiently done, and can challenge comparison and enquiry.

The effect of the Act depends upon two factors. First, the vigilance and capacity of Public Analysts to be ready to cope with the newest forms of adulteration, for it cannot be denied that as we advance in knowledge, and give the results of our experience to our fellow analysts by the medium of our Journal, professional sophisticators are not slow to learn from us, and use the knowledge we acquire to defeat our own efforts. The milk trade has long ago learnt that, owing to the fluctuation in the composition of natural milk, they can water good, rich milk to some extent, without much risk of detection. Indeed, a milkman once admitted to me that he had only added to a particular sample "the *legal* quantity of water," namely, a pint to a gallon. In the butter trade, likewise, I am convinced from extensive experience, admixture with margarine is practised, chiefly in France and Belgium, upon the basis of previous analysis, made with the object to ascertain how much each consignment will stand without overstepping the limits of insoluble fatty acids or of the Reichert test. In view of this experience it behoves us to consider whether it is wise to make analytical results so public that they are available to everyone; and whether, in many cases, it would not be better if methods of analysis were handed from analyst to analyst in a more private manner. I am persuaded that, in the end, the Public Analysts will cope with every, even the most scientific, form of adulteration; but until a full knowledge of the composition and analysis of articles of food is obtained, years must elapse, and in the meanwhile fraudulent manufacturers reap their harvest. As an illustration of this I need only recall the adulteration of lard with cotton-oil. It was only after this practice had been in use for a year or two, that our attention was directed to it, and proceedings taken with very satisfactory results. But when the silver test enabled us readily to discover cotton-oil, even in small quantities, it was found that by merely heating the oil in contact with air it lost its reducing powers.

The second factor which influences the success or failure of the Food Act is the activity of local authorities in availing themselves of its provisions. From the statistics published by the Local Government Board it is clearly seen that, generally, when but few samples are analysed in a district, the percentage of adulteration rises, while with the activity of the inspectors it falls, until it reaches what we may consider an irreducible minimum. This fact has been most clearly pointed out by my predecessor, Dr. M. A. Adams, in his admirable Report to the Kent County Council, dated October, 1891. In Somerset, in which county the Act has been most actively carried out, one sample was analysed in 1890 for every 379 inhabitants. The proportion of adulterated samples out

of every 100 analysed was as little as 3·6. In Gloucestershire one sample was analysed for every 770 inhabitants, and the percentage of adulterated samples was 6·2. In Bedfordshire one sample to 821 inhabitants with 7·1 as percentage of adulteration. In Hampshire one to 1,224 people with 12·2 per cent. of adulteration. In Derbyshire one to 3,164 with 17·1. Suffolk one to 4,199 with 17·6. Oxfordshire, which has the distinction of being at the bottom of the list, analysed one sample to 14,963, and had 41·7 per cent. of all articles analysed adulterated.

These figures convey, as plainly as figures can speak, the lesson that all advance in analytical knowledge is of no avail if authorities, for some reason or other, neglect to carry out the provisions of the Food and Drugs Act, while vigilance and activity all but stamp out adulteration.

It will be said that such energetic measures would cost the ratepayers a large sum of money. In the first place, I would reply to this: what if it cost a county even a thousand pounds a year to save a hundredfold that sum to its inhabitants in the course of a year? What can you do with the beggarly sums, which are devoted annually by most counties—the twenty pounds, or hundred pounds—which are now considered sufficient for the working of the Act? But, in the second place, I am strongly of opinion that the Act should, to a great extent, be self-supporting. The fines inflicted should be sufficient to cover the expenses; the fraudulent dealer should be made to pay for the protection of the honest ones. With penny fines this is not to be done, and magistrates must not assess the costs of analysis at 7s. 6d., when they really amount to half a guinea or a guinea, as happened quite lately in one of the districts for which I am Public Analyst.

It is well known that the fines inflicted under the Food Act are absurdly small, while for the same offence, when proceeded against under, say, the Trade Marks Act, substantial fines are inflicted. Quite lately, proceedings against a vendor of adulterated butter, under the Trade Marks Act, resulted in fines amounting to upwards of fifty pounds, whilst fifty pence would have been deemed excessive if the summons had been taken out under the Food Act.

In spite of all this, we Public Analysts can rest assured that we have done good work and have, on the whole, carried out the duties which we have undertaken to the immense benefit of the country. This must be recognised by the public sooner or later, but even if it were not, if ingratitude and ignorance should prevail, we shall continue in the path which we have mapped out for ourselves. Very much remains yet to be done, and we are not likely to have an idle time before us; problems are springing up at every hand; in fact, with advance of our knowledge we see, as is usual, how little we know, and many years must yet elapse before we can say that we have got a thorough knowledge of that great department of science—the science of the composition of food. It is all very well for an Act of Parliament to say "Let there be food analysts;" but only years of study, of patient work, of mutual aid and communication amongst Public Analysts, can produce what Parliament considered they could create in a day, namely, the ideal Public Analyst.

A vote of condolence with the widow of Mr. Heisch was, upon the motion of the President, unanimously passed.

The President reported that Dr. Vieth was about leaving London, he having accepted a post in the North of Germany. He (the President) said that in Dr. Vieth the Society would lose a valued member. Dr. Vieth had read a great many interesting papers before the Society, and had added considerably to their knowledge of milk analysis. He desired to state, on behalf of the Council, that Dr. Vieth would be proposed for election as an honorary member of the Society.

A vote of thanks to the President for his interesting address was moved by Dr. Sykes, and seconded by Mr. Cassal, who expressed a hope that the sentiments it contained would be propagated largely to the advantage of the profession.

The motion was put by Dr. Sykes and carried unanimously.

The following gentlemen were proposed:—As honorary member, Dr. P. Vieth. As members—Mr. J. C. Welch, Reading; Mr. George Pilkington, Manchester; Mr. Benedict Kitto, London. As associates—Mr. E. C. P. Barber, Leeds (assistant to Mr. Fairley); Mr. H. L. Haller, Hull (assistant to Mr. Baynes).

The President then declared that Messrs. James Nimmo and Samuel Rideal had been duly elected members of the Society, and Messrs. C. M. Caines and W. P. Skertchley, associates.

The scrutineers, after having examined the ballot papers, reported that the following gentlemen were elected officers for the ensuing year:—

President—Otto Hehner.

Vice-Presidents who have filled the office of President:—M. A. Adams, F.R.C.S.; A. H. Allen; A. Dupre, Ph.D., F.R.S.; Alfred Hill, M.B.; J. Muter, Ph.D., M.A., F.R.S.E. Who have not filled the office of President:—B. R. Tatlock, F.R.S.E.; S. Harvey; P. Vieth, Ph.D.

Treasurer—C. W. Heaton.

Hon. Secretaries—R. H. Davies; Bernard Dyer, B.Sc.

Other Members of Council—T. Fairley, F.R.S.E.; W. J. Sykes, M.D., D.P.H.; F. L. Teed, D.Sc.; E. W. Voelcker; C. R. A. Wright, D.Sc., F.R.S.

The names of those members whose term of office has not yet expired, and who consequently do not retire this year, are A. Ashby, M.B.; T. B. Blunt; Sir C. Cameron, M.D.; C. E. Cassal; G. Embrey; John Hughes; and T. Stevenson, M.D.

The following paper was then read by Mr. Vasey:—

THE ANALYSIS OF PEPTONES.

By C. W. HEATON AND S. A. VASEY (Charing Cross Hospital).

It is well known that in the digestion of meat by acid pepsin several compounds are obtained, which, although similar in composition, are by no means identical in chemical properties or nutritive value. Our knowledge of these compounds has of late been considerably extended, and various methods for their quantitative estimation have been

devised. We have no new re-agent to suggest; but after careful trial of all the processes at present in use, we have found that by a combination of several of them the analysis may be simplified.

The substances to be determined may, for analytical purposes, be classified as follows:—

1. Water; ash; total nitrogen.
2. Matters extracted by absolute alcohol. Definite compounds for the most part; some nitrogenous, some non-nitrogenous. It has been shown by M. Denaeyer (*v. infra*) that one variety of gelatin present in peptones is soluble in alcohol.
3. Albumins:—coagulated and rendered permanently insoluble by heat or by strong alcohol.
4. Albumoses:—not coagulated by heat. Soluble in water. Precipitated by alcohol, cupric hydrate, phospho-tungstic acid, mercuric chloride and ammonium sulphate.
5. Peptones:—not coagulated by heat. Soluble in water. Precipitated by alcohol, phospho-tungstic acid and mercuric chloride, but not by cupric hydrate or ammonium sulphate.
6. Gelatins:—partly soluble in alcohol. Precipitated entirely and in all forms by phospho-tungstic acid and ammonium sulphate. Not precipitated by cupric hydrate or mercuric chloride.

It is well known that the nitrogen in proteids varies from 14.4 per cent. in chondrin to over 18 per cent. in gelatin. (*Beilstein* iii., 1292-4.) Following previous workers, we have assumed 15.8 per cent. of nitrogen, which gives as the factor to be applied to the nitrogen 6.33. More exact knowledge is required before separate factors for each of the nitrogen determinations can safely be adopted.

The following is an abstract of the analytical methods described in recent researches from which our modified process has been derived:—

1. A. Stutzer (*Ber.* 13-251. *Ch. Soc. Absts.* 1880-676. *Cent. f. alleg. gesund. pflege*, 1882, 179. *Repert. Analy. Chem.* 1882-161. *Ch. Soc. Absts.* 1882-1239. *ANALYST* x. 57.)

Meat preparations are digested with pepsin in the usual manner. In the undissolved residue nitrogen is determined by soda-lime. The fluid is then agitated with cupric hydrate, suspended in weak glycerin, which, if the fluid be not too acid, throws down albumose. The separation appears to be complete, and the liquid filters well. In the cupric precipitate nitrogen is determined by soda-lime.

The cupric mixture can be prepared as follows:—

100 grammes of crystallized cupric sulphate are dissolved in 5 litres of water and 2.5 grammes of glycerin added. The solution is then made alkaline with caustic soda, and filtered. The precipitate is well mixed with a large excess of water containing 5 grammes of glycerin per litre. All traces of alkali are now completely removed by decantation and, if necessary, by filtration, the same glycerin solution being used throughout. The precipitate is then made up to 1 litre with water containing 10 per cent. of glycerin. The

thin emulsion then contains nearly 40 grammes per litre of cupric hydrate, and can easily be transferred by a pipette. It may conveniently be described as Stutzer's re-agent.

2. Kühne and Chittenden. (*Zeit. Biol.* xxii., 409, 423. *Ch. Soc. Abstr.* 1886, 818.)

The substance previously known as peptone was found to contain bodies of two kinds, one of which (albumose) can be precipitated and washed by a saturated solution of ammonium sulphate, while the other (peptone) remains in solution. The filtrate is concentrated until crystals of ammonium sulphate separate and the remaining sulphate is then removed by barium carbonate and hydrate, the excess of barium being carefully precipitated by sulphuric acid. Methods for the estimation of albumose and peptone are described. They involve the use of phospho-tungstic acid.

The paper contains much valuable matter in regard to the nature, composition and re-actions of peptones.

3. König and Kisch. (*Zeit. Analy. Chem.*, xxviii. 191. *Ch. Soc. Abs.* 1889, 803.)

The peptonic fluid is boiled and filtered. In the residue nitrogen is determined by the Kjeldahl process, and this multiplied by 6.25 gives albumen.

The filtrate is divided into two portions. In one, albumose only—as it was then thought—is thrown down and washed by ammonium sulphate, as in the method of Kühne and Chittenden, but the precipitate is treated differently.

It is weighed, and the ammonium sulphate in it is afterwards estimated volumetrically by barium chloride and deducted, the difference being taken as albumose. In the second portion both albumose and peptone are precipitated by phospho-tungstic acid. In the precipitate, nitrogen is estimated by the Kjeldahl process. Multiplying the nitrogen by 6.25, albumose and peptone are found, and so, of course, peptone by difference.

4. A. Denaeyer. (*Bull. de l'Assoc. Belge des Chimistes*, March, 1890. *ANALYST*, June, 1890.)

In this memoir it was shown that gelatin had been confounded with albumose in previous researches. Gelatin in all forms is precipitated by ammonium sulphate, so that the albumose found by the methods of Kühne and Chittenden and König and Kisch was really a mixture of albumose and gelatin. If albumin and albumose are previously separated, gelatin can be precipitated completely by ammonium sulphate. It is unnecessary to describe the analytical method founded on this important discovery, as it has been improved in a subsequent paper by the same author.

5. A. Denaeyer. (*Bull. de l'Assoc. Belge des Chimistes*, December, 1890. *ANALYST*, May, 1891.)

This memoir, recently translated and published with an addendum by Straker and Sons, London, contains later results of M. Denaeyer's work.

The analytical method which is described—although it is based upon those which preceded it—shows a distinct advance. Our own process is but a modification, and, we think, an improvement upon it. M. Denaeyer's system may be summarised as follows:—

(a) The peptonic fluid is treated with strong alcohol. After standing for 24 hours the precipitate, which consists of albumin, albumose, coagulable gelatin and

peptone, is washed with alcohol, dried and weighed. The solution is then divided into two portions, which are separately treated (*b* and *c*).

(*b*) One portion of the alcoholic solution is evaporated to dryness and extracted with warm water. Excess of saturated solution of ammonium sulphate is then added, and the mixture warmed. On cooling, the gelatin soluble in alcohol adheres to the basin, and may be washed slightly with ice-cold water, dried and weighed. It is then re-dissolved in warm water, and the ammonium sulphate in it estimated by barium chloride and deducted from the weighed gelatin.

(*c*) The second portion of the alcoholic solution is evaporated to dryness, dried over phosphoric anhydride for 8 hours and weighed. This operation is difficult as the residue is very hygroscopic, and M. Denaeyer prefers to estimate the extractives approximately by difference.

The alcoholic precipitate is treated with warm water and filtered from albumin, which can be weighed in a tared filter. The solution is then divided into three portions.

(*d*) Of these, one is treated with excess of solution of phospho-tungstic acid.

This throws down albumose, gelatin and peptone. The precipitate is thrown on a tared Schleicher's filter, washed with dilute hydrochloric acid, dried and weighed. It is then burnt, and the proteids found by difference.

(*e*) Another portion of the aqueous solution of the alcoholic precipitate is treated with ammonium sulphate as in process (*b*).

The weight of the precipitate, after deducting the sulphate, gives albumose and gelatin.

(*f*) The third portion is accurately neutralised and treated with excess of saturated solution of mercuric chloride. This throws down albumose and peptone, but not gelatin. The precipitate is rejected. The filtrate is treated as before with ammonium sulphate, and the weight of gelatin insoluble in alcohol determined.*

True peptone is now, of course, found by difference.

This scheme for the analysis of peptones is certainly the best that has hitherto been devised, but it is liable to objection in one or two respects. The process which we have adopted, and in which that of Stutzer is incorporated, appears to us simpler and more satisfactory.

6. A. Denaeyer. (*Jour. Pharm. Anvers*, November, 1891. *ANALYST*, December, 1891.)†

This is an admirable process for a simple assay of genuine commercial peptones. 10 c.c. of aqueous peptone, containing about 2 grammes of dry matter, are treated with 100 c.c. of strong alcohol. After standing for 24 hours the precipitate is washed with alcohol, dried and weighed. The alcoholic solution is also dried at 105° C. and weighed.

* In a subsequent note M. Denaeyer recommends the removal of excess of mercury by H_2S , and points out that the phospho-tungstic treatment may be avoided.

† Our paper was written before this note appeared.

M. Denaeyer holds that in a well-prepared peptone the alcohol extractive should not exceed 30 per cent., but we are inclined to think this too low an estimate. A large proportion indicates that leucine, tyrosine, and other products of metamorphosis are present. It is evident that this process is not intended to replace more exact methods of analysis. Its greatest defect is that, if gelatin had been added to the peptone, it would be precipitated by alcohol, and would, therefore, be weighed with the nutritive constituents.

THE MODIFIED PROCESS.

It is convenient to work with a tolerably concentrated solution. Any portion insoluble in warm, but not boiling water may be removed by filtration, and treated separately for nitrogen, &c. If a jelly be under examination it must be liquefied by heat or by dilution. In the following synopsis a strength of about 20 per cent. of solid matter is assumed. It is obvious that in any such scheme of analysis the mineral salts must be included among the organic proximate constituents, for our knowledge does not yet permit us to assign to albumose, peptone and the like, any definite proportion of mineral compounds. It is best to make separate estimations of water, ash and total nitrogen.

1. *Water ; ash ; total nitrogen.*—Estimated as usual. About 3 grammes for water and ash and about 1 gramme for total nitrogen, by the Kjeldahl method, are convenient quantities.

2. *Albumin ; gelatin insoluble in alcohol (coagulable gelatin) ; albumose ; peptone.*—40 grammes of fluid peptone containing about 80 per cent. of water are dropped gradually into 300 c.c. of nearly anhydrous alcohol, in a large weighed beaker and the mixture agitated by gentle centrifugal motion. After an hour or so the above-named compounds will have separated and can be washed with absolute alcohol by decantation. The alcoholic solution is preserved for further treatment and is hereafter alluded to as the *Stock alcoholic solution*. The beaker, with its contents, is then dried to constant weight at 100° C.

(a.) *Albumin.*—The weighed alcoholic precipitate is digested with warm water and washed on a tared filter. The residue, which has been rendered insoluble by the alcohol, is weighed as albumin.

The filtrate from albumin is diluted with water to 250 c.c. This may be described as the *Stock aqueous solution*.

(b.) *Albumose and gelatin.*—25 c.c. of stock aqueous solution are evaporated to a few c.c., treated with saturated solution of ammonium sulphate, raised to nearly 100° and quickly cooled with centrifugal agitation. The ppt. is thrown on a tared filter, washed with ammonium sulphate, dried and weighed. In the ppt. the excess of ammonium sulphate is afterwards estimated gravimetrically by barium chloride and deducted.

(c.) *Albumose.*—50 c.c. of stock aqueous solution are raised to near 100° C. and are then treated with 30 c.c. of Stutzer's reagent. The ppt. is washed in a filter with hot water and the nitrogen contained in it estimated by the Kjeldahl method. 30 c.c. H_2SO_4 and a globule of mercury give good results.

(d.) *Gelatin*.—It is evident that from the results of the two last operations both gelatin and peptone may be found by difference, and our experiments convince us that a satisfactory assay may be obtained in this way. But a direct estimation of gelatin may be made as follows. The filtrate from the copper ppt. is concentrated to a few c.c., in a beaker previously weighed with a glass rod, saturated solution of ammonium sulphate is then added, the mixture raised nearly to the boiling point and then quickly cooled with centrifugal agitation. As M. Denaeyer has shown, the gelatin now separates and adheres to the sides and bottom of the beaker, particularly if touched from time to time with the rod. The gelatin may now be once washed rapidly with ice-cold water, dried and weighed and the ammonium sulphate retained in it estimated and deducted as before.

3. With regard to the alcoholic extract which we have described as the stock alcoholic solution, we confirm M. Denaeyer's statement that the dried extract is too hygroscopic to permit any accurate inference to be drawn from its weight. It is better to adopt the following method, which is in substantial agreement with that recommended by M. Denaeyer. The stock alcoholic solution is made up to a definite volume, say to 500, c.c. This is divided into fractions for separate treatment.

(a.) *Gelatin soluble in alcohol*.—One fraction, say 1·5th., is evaporated to dryness, taken up with warm water and treated with ammonium sulphate in the manner already described.

(b.) *Urea, &c.*—Another fraction, 1·10th., may be evaporated to dryness and treated with sodium hypobromite. But evidently the nitrogen could not with any accuracy be calculated as urea.

(c.) *Nitrogen*.—Another fraction, 1·5th., may be evaporated and treated by the Kjeldahl method for nitrogen. After deducting the nitrogen present as soluble gelatin, the residue multiplied by 3·12 gives the creatin-equivalent of crystallisable nitrogenous compounds.

(d.) *Ash in alcohol extractive*.—Another fraction may be used for the determination of ash.

The following analysis of a sample of beef-peptone prepared by M. Denaeyer will serve to illustrate the system.

The peptone was a semi-solid jelly, liquefied by gentle heat. It was sterile and bright, and was free from bitterness. It tasted like beef-tea and mixed easily with water.

I.						
Organic matters	...	...	...	...	...	15·59
Mineral matters	...	...	...	...	...	2·43
Water	...	...	...	...	...	81·98
						100·00

II.

Albumins coagulated by heat and alcohol	...	...	0.12
Matters precipitated by alcohol:—			
Gelatin (direct weighing)	...	...	2.00
Albumose (Am. sulphate ppt. <i>minus</i> gelatin)	5.06		
[N.B.] Albumose found by estimation of N. in Cu. ppt. $.79 \times 6.33 = 5.00$			
Peptone (difference)	...	...	3.33
Total (direct weighing)	...	...	10.39
Matters not precipitated by alcohol:—			
Gelatin soluble in alcohol (direct weighing)	...	1.30	
Extractive, &c. (difference)	...	6.21	
Total	...	...	7.51
Water	...	...	81.98
			100.00

III.

Nitrogen (Kjeldahl):—

Total	...	...	2.67
In alcoholic ppt.	...	...	1.38
In albumose...	...	...	.79
Liberated by NaBrO	...	...	.22

In the absence of the respective authors, the Secretary read the following papers:—
 “ON BORACIC ACID AND BORAX IN MILK AND BUTTER,”
 by W. W. FISHER, M.A., OXON.; and

SUPPLEMENTARY NOTE ON THE ANALYSIS OF WHITE PEPPER.

By W. F. K. STOCK, F.C.S., F.I.C.

At the reading of a previous paper on the Adulteration of White Pepper (THE ANALYST, vol. xvi., p. 224), some misapprehension appeared to arise in respect of the effect of “grading” white pepper. I stated (p. 226) that “by no process of grading can the normal relation of the ash constituents of the *kernels* be disturbed,” and this, judging from some remarks which afterwards fell from the President, seems to have been taken as meaning that white pepper could not be graded. That was evidently a mistake, for there are no fewer than six or eight “grades” of commercial ground white pepper, and the point which I especially wished to bring before the Society of Public Analysts was, not that grading could not be done, but that it could not increase the proportion of ash beyond certain limits, and, more particularly, that it could not account for the presence of an abnormal proportion of calcium compounds in the ash of pepper.

As a means of removing doubt, I have made some further experiments upon the subject, and the results recorded below appear to me to prove my point beyond question.

A large sample of good quality commercial "decorticated" peppercorns was purchased. It was found to be nearly free from husk, and to consist almost entirely of the kernels.

These peppercorns were carefully ground and "graded" in the Laboratory, and they yielded the following percentage proportions :—

No. 1	Grains exceeding 1/16th in. diameter	...	...	17·63
No. 2	" between 1/16th in. and 1/36th in. diameter	..	32·06	
No. 3	" " 1/36th in. and 1/70th in.	"	...	26·76
No. 4	" below 1/70th in. diameter	...	...	23·55
				100·00

No. 5. The same peppercorns ground but not graded.

The five samples thus got were analysed with the following results :—

Determination.	No. 1 Grade.	No. 2 Grade.	No. 3 Grade.	No. 4 Grade.	No. 5 Not Graded.
Water	14·12	14·38	14·04	15·10	14·24
Fibre	·41	·65	·55	·65	·48
Ash	1·25	1·15	1·23	1·23	1·13
Lime in Pepper calculated to Carbonate ...	·29	·32	·30	·39	·32
Percentage Proportion of Lime to Ash in } terms of Carbonate }	23·5	27·9	24·3	31·7	28·3

I claim that the constancy of the ash percentages in the above table prove my point conclusively. I may be met with the objection that there are marked discrepancies in the ratios of Lime to Ash in terms of Carbonate. I am quite willing to admit that there are discrepancies, but members of this Society will hardly need to be told that *pure* pepper seldom yields, by simple ignition, an equally pure ash. I have made no attempt to elaborate the experiments by freeing the ash from residual carbon, etc., preferring to work upon the simple lines laid down in the paper already contributed.

The President wished to take the opportunity of making an explanation. It would be remembered that some time ago Mr. Stock was good enough to write a paper on pepper. In the discussion which followed, he (Mr. Hehner) made what he then thought were some quite innocent remarks, referring the members to a paper which he had read about that time on the grading of peppers. Mr. Stock had asked him to remove the wrong impression which he thought his (Mr. Hehner's) remarks had created. He might without any hesitation say that the paper in question—an abstract of which had since appeared in THE ANALYST*—referred to black peppers and not to white peppers, whilst

* Volume xvi., p. 235.

Mr. Stock's remarks were entirely directed to white. He (Mr. Hehner) wished to congratulate himself and the Members of the Society that his few remarks had led Mr. Stock to further enlighten them on the subject.

The two following papers were read by the Secretary :—

NOTE UPON THE ESTIMATION OF MILK SUGAR IN MILK.

AUGUSTUS H. GILL, PH.D.

THE main difficulty in this determination, as ordinarily carried out, is in obtaining a filtrate sufficiently clear for titration : as prepared by the usual methods, it is opalescent, or even quite turbid, from the fat which passes through the filter.

It has been found that by making use of the well known property of aluminium hydrate to drag down precipitates, and by following the recommendations of Radliscu,* regarding the amount of acid, intensity and duration of heating, all of which are of great influence in the rapidity and completeness of the curdling, that a clear filtrate is readily obtained.

The method is as follows : 25 c.c. of the milk are mixed with 15 c.c. "milk of alumina," and 0.5 c.c. of twenty-five per cent. acetic acid added, the mixture stirred and heated 5—7 minutes in a water bath, the temperature of which is 85° C. One hundred cubic centimeters of water are now added and the mixture is heated in boiling water, for ten minutes, with frequent stirring. It is thoroughly cooled under the tap, allowed to settle and decanted through a plaited filter (S. & S. 597), into the 500 c.c. graduated flask, being careful to bring as little precipitate upon the filter as possible. The operations of boiling and filtering are repeated three times and the filtrates made up to 500 c.c. It is then ready for titration by Fehling's solution in the usual way.

The "milk of alumina" is prepared by precipitating at the boiling temperature 125 grms. ammonia alum with ammonium hydrate, washing the precipitate by decantation and making it up to one litre.

The method has been in use by the students here for a year, and has given very satisfactory results.

MASS. INST. OF TECHNOLOGY, BOSTON, MASS., U.S.A.

LABORATORY OF SANITARY CHEMISTRY.

THE POSTAL TRANSMISSION OF SAMPLES.

By ALFRED ASHBY, M.B.

ON the passing of the Sale of Food and Drugs Act, 1875, when the analyst did not reside within two miles of the residence of any person requiring an article to be analysed, it might be forwarded to him through the Post Office, *as a registered letter*, subject to any regulations which the Postmaster-General might make in reference to the carrying and delivery of such article.

* Mittheilungen a. d. pharm. Inst. u. Labor. d. Univ. Erlangen. Hilger, Heft III., pp. 93—112.

This was the only legal way of conveying a sample under the Act, otherwise than by direct delivery of it by the purchaser to the analyst.

The Postmaster-General issued the necessary regulations, and they were in force for some time, but were subsequently withdrawn, when samples were no longer permitted to be sent through the Post Office in the only manner permitted by the Act, consequently, for a considerable period, there was no legal way of conveying articles purchased under it, other than by actual delivery from the purchaser to the analyst.

Nevertheless, many continued to be sent through the Post Office, but without registration, and it was foreseen by some of us that, sooner or later, prosecutions would fail through the informal delivery of samples.

This event, I believe, has happened somewhere in the Isle of Wight.

The difficulty has now been removed by the eleventh section of the Post Office Act, 1891 (54 & 55 Vict., c. 46), which amends the Act of 1875 in the following terms:—"In section sixteen of the Sale of Food and Drugs Act, 1875, respecting an article forwarded to the analyst through the Post Office, the words 'registered parcel' shall be substituted for the words registered letter."

Now that parcels may be registered in the same way as letters there is no longer, by virtue of this amendment, any impediment to the transmission of articles to analysts through the Post Office, when that mode of delivery is authorised by the Act of 1875; and if any future prosecution should fall through, owing to informal delivery of the sample, it will be due entirely to the carelessness of the purchaser.

I think the importance of this amendment is sufficient to warrant my bringing it to the notice of all public analysts, so that if it has escaped the notice of any, they may at once take the steps necessary to ensure all samples being sent to them in a legal manner by the officers of the local authorities for whom they act.

The President thanked the meeting for the honour they had done him in electing him President. He might say that the last year had passed in a very pleasant manner, and he thought he was entitled to say that he had kept on friendly terms with every one of the members.

It was their duty to pass a vote of thanks to the Chemical Society for the permission which had been accorded them of holding their meetings in that room; he, therefore, as President, proposed that the Secretaries convey the thanks of the Society to the Chemical Society. The vote was passed with acclamation; and this terminated the proceedings of the Society.

The Recognition of Unorganised Ferments in Blood. R. Kobert.
(*Read at the 64th meeting of the Deutsch. Naturforsch. u. Aerzte. Through Chem. Zeit.*).—The recognition of easily decomposed poisons in blood (frequently necessary, both for physiological purposes and for those of medical jurisprudence), is often difficult, on account of the red blood corpuscles by putrefaction or other causes becoming converted into a tarry

mass which is troublesome to deal with chemically and is useless for physiological examination. The removal of this substance is usually effected by dilution and heating after the addition of acetic acid, or by precipitation by alcohol, by potassium ferrocyanide and acetic acid, or by uranium nitrate. In all these cases the serum albumen, the albuminous enzymes and tox-albumens are also precipitated, on which account the recognition and isolation of the last two classes of substances are impossible.

The precipitant proposed by the author is powdered zinc. This reagent has for the forensic chemist, who has usually to deal with old putrid samples of blood, the advantage that it effects almost complete deodorisation. The completeness of the precipitation is not affected by the age of the sample. The following precautions are necessary:—

1. Perfectly fresh blood, which is always alkaline, must be neutralised previous to the addition of the zinc. The same remark applies to blood taken from bodies some weeks after death, in which the formation of ammonia has occurred. The normal alkalinity of blood disappears in 1 or 2 days whether kept in contact with air or allowed to remain in the corpse; even in the living subject it decreases enormously in certain illnesses [notably in fever] and in these instances zinc can be added direct.

2. The blood must be free from methæmoglobin. If present, the blood must be allowed to stand unshaken and undiluted in a corked vessel until the last trace is gone. It is well known that this removal is effected spontaneously alike in the body as in the collecting vessel, frequently in as short a time as twenty-four hours, even when the quantity of methæmoglobin is considerable.

3. The blood must be diluted with water to three or four times its original bulk.

4. The powdered zinc must be perfectly pure; that is, consist wholly of zinc and zinc oxide.

5. The quantity of zinc must be from $\frac{1}{4}$ to $\frac{1}{2}$ of the original weight of the blood.

6. The mixture must be vigorously shaken for some time.

When these conditions are complied with, the separation of the colouring matter of the blood is almost always complete, so that on washing the precipitate on the filter-press or on the filter-pump with a large amount of water, nothing goes again into solution. The yellowish brown colouring matter present in some bloods, is, of course, not precipitated and goes into the filtrate. The filtrate only contains tangible quantities of zinc in those cases in which compounds of organic acids were present in the blood. In the absence of these, only traces of zinc are present as albuminate, the quantity of which is smaller the freer the powdered zinc was from zinc oxide. The only poisons likely to be present in the precipitate are hydrocyanic acid and carbonic oxide, the former of which can be extracted with alcohol and the latter removed by the aid of the air pump.

The filtrate is vastly more suitable for physiological and chemical examination than the original blood. For observing its physiological effect, a portion is treated with one drop of sodium sulphide solution, shaken, and filtered from the precipitate of zinc sulphide, and the filtrate free from both zinc and sodium sulphide injected into a test animal [a mouse or kitten]. Usually the original filtrate without previous removal of

zinc can be used equally well. The bacteria always present in putrid blood are almost completely retained in the precipitate. When the filtrate is required absolutely free from bacteria it can be passed through a Chamberland filter. Should the test animal show strong symptoms of poisoning a second portion of the original filtrate is freed from zinc and albuminous matter by the addition of a drop of a solution of potassium ferrocyanide and a little acetic acid, and a second test made. If no poisoning be then perceptible the first test animal can only have been affected by some albuminous substance, inasmuch as potassium ferrocyanide could not have precipitated any other poison, in a solution so diluted, except possibly a portion of the strychnine, if that alkaloid be present. The isolation of the poisonous albuminous substances can only be effected by precipitation of the chief portion of the filtrate with alcohol in the ordinary manner or by salting out with ammonium sulphate. Should the second test animal show symptoms of poisoning like the first, the poison cannot be of albuminous character or at least not of the usual kind precipitable by potassium ferrocyanide. The original filtrate is then freed from albuminous matter and examined for other poisons by Dragendorff's method, the task being lightened by the circumstance that scarcely any foreign matter can be present.

In order to prove the utility of the method, portions of blood of 30 to 50 c.c. were mixed with 0.5 to 1.0 mgm. of strychnine, atropine, sapotoxine, and cadaverine, and these poisons recognised and recovered without difficulty. The method was further tested in cases of poisoning with alcohol, sulphuric acid and acetic acid, and by its aid alkaloidal substances were detected in the blood of persons who had died of such complaints as meningitis, peritonitis, and scarlatina. The process is also available for the estimation of sugar in blood.

B. B.

Testing Ammonia Solution. J. Hertkorn. (*Chem. Zeit.* 1891, xv, 1493.)—

The method of testing ammonia solution for the presence of ammonium carbonate prescribed by the German pharmacopœia, consists in mixing the liquid with an equal volume of lime-water which should produce only slight turbidity. The author finds, however, that the chief portion of the carbonic acid contaminating commercial ammonia is not present as ammonium carbonate, but is derived from the ammonium carbamate generally present, the deduction being based on the observation, that on heating the ammonia solution with lime-water, a much more copious precipitation is obtained than in the cold. According to this, a sample which complies with the ordinary test may be quite unfit for analytical purposes, such as the separation of metals of the ammonium sulphide group from the alkaline earths, the determination of carbonic acid in beer, aerated waters, koumiss, &c.

B. B.

The Reactions of Salicylic Acid. G. Kottmeyer. (*Pharm. Post*, 1891, xxiv, 751, through *Chem. Zeit.*)—According to Vortmann, neutral salicylates give no precipitate with barium chloride or calcium chloride, even on the addition of ammonia, or on heating, or when an equal bulk of alcohol is added. Contrary to these assertions

the author finds that a 20 per cent. solution of sodium salicylate gives an immediate precipitate on shaking with a strong solution of calcium chloride; a 10 per cent. solution also gives a precipitate when ammonia is added; even a 1 per cent. solution mixed with a few drops of strong calcium chloride solution gives a precipitate on adding a little ammonia and shaking or warming. A slight precipitate is produced when barium chloride is added to a 20 per cent. solution of sodium salicylate, and a turbidity when a 10 per cent. solution is used.

B. B.

The Detection of Turkish Essence of Geranium in Rose Oil. G. Panajotow. (*Ber.* 1891, xxiv. 2700, through *Chem. Zeit.*)—The samples of rose oil from Southern Bulgaria and Turkey are often adulterated with Turkish essence of geranium. This may be detected by treating two or three drops of the suspected specimen with 2 c.c. of fuchsin solution, which give a blue colouration, if even only a small quantity of the adulterant be present. Pure samples give a red colouration, but only after about twenty-four hours. Another method consists in heating the sample in a watch-glass with strong sulphuric acid, dense white tarry smelling fumes being given off by essence of geranium, and a thick red-brown fluid being formed, which becomes turbid on the addition of 95 per cent. of alcohol, yellow flocks separating, and the solution first becoming red, and then turning yellow on standing. A pure sample thus treated gives a red-brown liquid, which dissolves, and becomes almost colourless on the addition of alcohol.

B. B.

Alberti and Hempel's Method of Determining the Ash of Sugar. (*J. Fabr. Sucre.* 1891, xxxii. 37.)—Sidersky objects to this method (which was described in *THE ANALYST* xvi., 220), on the ground that ignition with sand decomposes the nitrates present in cane-sugar, necessitating a separate determination of their quantity in order to obtain an accurate determination of the total amount of organic matter in the sample analysed, and doubts whether it will displace the conventional method. An editorial note is appended to the abstract of this paper appearing in the *Chemiker Zeitung* to the effect that the objection has weight chiefly in the case of French, and possibly Belgian, sugars which contain more nitrate than German and Austrian samples, and will be even in these of decreasing importance, as the mode of cultivation is improved, and further states that a change in the conventional method is both desirable and imminent.

B. B.

Alberti and Hempel's Method of Determining the Ash of Sugar. (*J. D. Zuckerind.* 1891, xvi. 1285.)—Alberti and Hempel, replying to Sidersky's objection (see preceding abstract) to their method, state that they have not overlooked the decomposition of the nitrates by sand, but thought well to ignore the correction it strictly involves, when formulating their method. The platinum vessels used are not severely corroded, as was at first feared, and only need scouring or cleansing by fusion with soda, after they have been used some forty times.

B. B.